

CLAIMS:

1. A medical gas alarm system for use in a healthcare facility having a medical gas system and having a network of computer devices, the medical gas alarm system comprising
 - 5 at least one area alarm controller adapted to receive a first signal indicative of a condition of a first portion of the medical gas system and adapted to communicate with the network, and
 - at least one master alarm controller adapted to receive a second signal indicative of a condition of a second portion of the medical gas system and adapted to communicate with the network, the at least one area alarm controller being adapted to communicate with the at least one master alarm controller through the network.
- 10 2. The medical gas alarm system of claim 1, wherein the area alarm controller is adapted to couple to a first network hub of the network.
3. The medical gas alarm system of claim 2, wherein the master
 - 15 alarm controller is adapted to couple to a second network hub of the network.
4. The medical gas alarm system of claim 3, wherein the master alarm controller communicates with a server of the network through the second network hub.
5. The medical gas alarm system of claim 3, wherein the alarm
 - 20 controller communicates with a server of the network through the first network hub.
6. The medical gas alarm system of claim 3, wherein the area alarm controller communicates with the master alarm controller through the first and second network hubs.
7. The medical gas alarm system of claim 1, further comprising a
 - 25 plurality of sensor modules configured to sense gas pressures in respective gas pipes of the medical gas system, the area alarm controller including a plurality of display modules, each display module being associated with a respective sensor module, and each display module being configured to display the gas pressure sensed by the respective sensor module.
- 30 8. The medical gas alarm system of claim 7, wherein the area alarm controller includes a first electric circuit coupled to the network, the first electric circuit also being coupled to the plurality of display modules and to the

plurality of sensor modules, and the first electric circuit operating to communicate the gas pressures sensed by the plurality of sensor modules to the network.

9. The medical gas alarm system of claim 8, wherein the master controller includes a second electric circuit that receives from the network the gas pressures sensed by the plurality of sensor modules.

10. The medical gas alarm system of claim 8, wherein the master controller includes a second electric circuit, the first electric circuit including a first microprocessor, the second electric circuit including a second microprocessor, and each of the plurality of sensor modules includes a respective microprocessor.

11. The medical gas alarm system of claim 7, wherein the area alarm controller activates a first audible alarm when an alarm condition in the medical gas system is sensed by any one of the sensor modules and the master alarm controller activates a second audible alarm when the first audible alarm is activated.

12. The medical gas alarm system of claim 11, wherein the area alarm controller includes a user input operable to silence the first audible alarm and when the first audible alarm is silenced, the area alarm controller notifies the master alarm controller through the network that the first audible alarm is silenced.

13. The medical gas alarm system of claim 11, wherein the area alarm controller includes a first user input operable to silence the first audible alarm and the master alarm controller includes a second user input operable to silence the second audible alarm.

14. The medical gas alarm system of claim 7, wherein the area alarm controller activates a first visual alarm when an alarm condition in the medical gas system is sensed by any one of the sensor modules and the master alarm controller activates a second visual alarm when the first visual alarm is activated.

15. The medical gas alarm system of claim 14, wherein at least one of the first visual alarm and the second visual alarm includes an LED.

16. The medical gas alarm system of claim 14, wherein the master alarm controller includes a display screen and the second visual alarm includes a text message that appears on the display screen.

17. The medical gas alarm system of claim 7, wherein each transducer module is configured to sense the pressure of a specific type of gas, each

display module is configured to display pressure information for a specific type of gas, each transducer module transmits a code to its associated display module, and the display module analyzes the code to determine whether the display module is compatible with the associated transducer module.

5 18. The medical gas alarm system of claim 7, wherein the master alarm controller includes user inputs operable to send programming signals over the network to set high-pressure alarm points and low-pressure alarm points of each of the display modules.

19. The medical gas alarm system of claim 7, wherein the area
10 alarm controller is configured to receive programming signals from at least one
computer device of the network and the programming signals set high-pressure alarm
points and low-pressure alarm points of each of the display modules.

20. The medical gas alarm system of claim 1, wherein the area
alarm controller activates a first audible alarm when the first signal indicates that an
15 alarm condition is occurring in the first portion of the medical gas system and the
master alarm controller activates a second audible alarm when the first audible alarm
is activated.

21. The medical gas alarm system of claim 20, wherein the area alarm controller includes a user input operable to silence the first audible alarm and when the first audible alarm is silenced, the area alarm controller notifies the master alarm controller through the network that the first audible alarm is silenced.

22. The medical gas alarm system of claim 20, wherein the area
alarm controller includes a first user input operable to silence the first audible alarm
and the master alarm controller includes a second user input operable to silence the
25 second audible alarm.

23. The medical gas alarm system of claim 1, wherein the area alarm controller activates a first visual alarm when the first signal indicates that an alarm condition is occurring in the first portion of the medical gas system and the master alarm controller activates a second visual alarm when the first visual alarm is activated.

24. The medical gas alarm system of claim 23, wherein at least one of the first visual alarm and the second visual alarm includes an LED.

26. The medical gas alarm system of claim 1, wherein the master alarm controller includes a display screen that displays text messages corresponding to alarm conditions occurring in the first portion and the second portion of the medical gas system.

an alarm controller adapted to receive an input signal indicative of a condition of the medical gas system, the alarm controller being adapted to couple to the network, and the alarm controller being adapted to generate output data that is accessible to the plurality of personal computers included in the network.

29. The medical gas alarm system of claim 28, wherein the website comprises a plurality of web pages and at least some of the web pages are password protected.

31. The medical gas alarm system of claim 28, wherein the electric circuit of the alarm controller is configured to receive input data from the plurality of personal computers via the website.

32. The medical gas alarm system of claim 31, wherein the alarm controller includes a plurality of input ports, each input port is capable of receiving the input signal, and the input data received by the alarm controller programs the electric circuit with information regarding which input port of the plurality of input ports is receiving the input signal.

33. The medical gas alarm system of claim 31, wherein the input data received by the alarm controller programs the electric circuit with a gas type associated with the input signal.

34. The medical gas alarm system of claim 31, wherein the alarm
5 controller includes a display screen and the input data programs the electric circuit with a text message to be displayed on the display screen when the input signal indicates that an alarm condition exists in the medical gas system.

35. The medical gas alarm system of claim 31, wherein the alarm
10 controller includes a plurality of LED's that provide visual indicators of alarm conditions occurring in the medical gas system and the input data programs the electric circuit to assign one of the LED's to the input signal.

36. The medical gas alarm system of claim 31, wherein the input data received by the alarm controller programs the electric circuit with a device name associated with the input signal.

37. The medical gas alarm system of claim 31, wherein the input
15 data received by the alarm controller programs the electric circuit with information that associates a location in the healthcare facility with the input signal.

38. The medical gas alarm system of claim 31, wherein the electric
20 circuit includes a clock and the input data received by the alarm controller programs the clock with a date and a time.

39. The medical gas alarm system of claim 31, wherein the input data received by the alarm controller programs the electric circuit with a user name and a password associated with the user name.

40. The medical gas alarm system of claim 31, wherein the electric
25 circuit includes a memory device in which application software is stored and the input data includes application software that is downloaded into the memory device.

41. The medical gas alarm system of claim 28, wherein the output data includes alarm information about alarm conditions occurring in the medical gas system and the website includes a web page at which the alarm information is
30 viewable.

42. The medical gas alarm system of claim 41, wherein the alarm information includes a gas type associated with each alarm condition.

44. The medical gas alarm system of claim 41, wherein the alarm information indicates whether an audible alarm associated with each alarm condition has been silenced.

10 46. The medical gas alarm system of claim 45, wherein the setup
information includes a list of gases included in the medical gas system.

48. The medical gas alarm system of claim 45, wherein the setup
15 information indicates at least one of a serial number of the alarm controller, a model
number of the alarm controller, and a software version of application software stored
in the alarm controller.

49. The medical gas alarm system of claim 28, wherein the output data includes an event log, the event log lists occurrences of alarm conditions in the medical gas system, and the website includes a web page at which the event log is viewable.

50. The medical gas alarm system of claim 49, wherein the event log indicates a date of occurrence for each alarm condition listed on the event log, a time of occurrence for each alarm condition listed on the event log, and a description of each alarm condition listed on the event log.

51. The medical gas alarm system of claim 28, wherein the output data includes network address information that is associated with the alarm controller and the website includes a web page at which the network address information is viewable.

30 52. The medical gas alarm system of claim 51, wherein the network address information includes at least one of an Internet Protocol (IP) address, a subnet identifier, a gateway identifier, and a Mac address.

controller is adapted to receive input data from the plurality of personal computers included in the network.

5 controller includes a plurality of input ports, each input port is capable of receiving the input signal, and the input data received by the alarm controller identifies which input port of the plurality of input ports is receiving the input signal.

10 signal.

controller includes a display screen and the input data programs the alarm controller with a text message to be displayed on the display screen when the input signal indicates that an alarm condition exists in the medical gas system.

15 57. The medical gas alarm system of claim 53, wherein the alarm controller includes a plurality of LED's that provide visual indicators of alarm conditions occurring in the medical gas system and the input data assigns one of the LED's of the plurality of LED's to the input signal.

58. The medical gas alarm system of claim 53, wherein the input
20 data received by the alarm controller programs the alarm controller with a device
name associated with the input signal.

59. The medical gas alarm system of claim 53, wherein the input data received by the alarm controller programs the alarm controller with information that associates a location in the healthcare facility with the input signal.

25 60. The medical gas alarm system of claim 53, wherein the alarm
controller includes a clock and the input data received by the alarm controller
programs the clock with a date and a time.

61. The medical gas alarm system of claim 53, wherein the input
data received by the alarm controller programs the alarm controller with a user name
30 and a password associated with the user name.

62. The medical gas alarm system of claim 53, wherein the alarm controller includes a memory device in which application software is stored and the input data includes application software that is downloaded into the memory device.

63. The medical gas alarm system of claim 27, wherein the output
5 data includes alarm information about alarm conditions occurring in the medical gas system.

64. The medical gas alarm system of claim 63, wherein the alarm information includes a gas type associated with each alarm condition.

65. The medical gas alarm system of claim 63, wherein the alarm
10 information includes a location in the healthcare facility at which each alarm condition is occurring.

66. The medical gas alarm system of claim 63, wherein the alarm information indicates whether an audible alarm associated with each alarm condition has been silenced.

67. The medical gas alarm system of claim 27, wherein the output
15 data includes setup information indicating how the alarm controller is set up.

68. The medical gas alarm system of claim 67, wherein the setup information includes a list of gases included in the medical gas system.

69. The medical gas alarm system of claim 67, wherein the setup
20 information indicates a location in the healthcare facility of the alarm controller.

70. The medical gas alarm system of claim 67, wherein the setup information indicates at least one of a serial number of the alarm controller, a model number of the alarm controller, and a software version of application software stored in the alarm controller.

71. The medical gas alarm system of claim 27, wherein the output
25 data includes an event log that lists occurrences of alarm conditions in the medical gas system.

72. The medical gas alarm system of claim 71, wherein the event log indicates a date of occurrence for each alarm condition listed on the event log, a
30 time of occurrence for each alarm condition listed on the event log, and a description of each alarm condition listed on the event log.

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74. The medical gas alarm system of claim 73, wherein the network address information includes at least one of an Internet Protocol (IP) address, a subnet identifier, a gateway identifier, and a Mac address.

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83. The alarm controller of claim 81, wherein the setup information indicates a location in the healthcare facility of the alarm controller.

84. The alarm controller of claim 81, wherein the setup information indicates at least one of a serial number of the alarm controller, a model number of the alarm controller, and a software version of application software with which the alarm controller is programmed.

85. The alarm controller of claim 76, wherein the output data includes an event log that lists occurrences of alarm conditions in the medical gas system.

86. The alarm controller of claim 85, wherein the event log indicates a date of occurrence for each alarm condition listed on the event log, a time of occurrence for each alarm condition listed on the event log, and a description of each alarm condition listed on the event log.

88. The alarm controller of claim 87, wherein the alarm controller includes a plurality of input ports, each input port is capable of receiving the input signal, and the input data received by the alarm controller identifies which input port of the plurality of input ports is receiving the input signal.

89. The alarm controller of claim 87, wherein the input data received by the alarm controller identifies a gas type associated with the input signal.

91. The alarm controller system of claim 87, wherein the alarm controller includes a plurality of LED's that provide visual indicators of alarm conditions occurring in the medical gas system and the input data assigns one of the LED's of the plurality of LED's to the input signal.

92. The alarm controller of claim 87, wherein the input data received by the alarm controller programs the alarm controller with a device name associated with the input signal.

93. The alarm controller of claim 87, wherein the input data received by the alarm controller programs the alarm controller with information that associates a location in the healthcare facility with the input signal.

94. The alarm controller of claim 87, wherein the alarm controller
5 includes a clock and the input data received by the alarm controller programs the clock with a date and a time.

95. The alarm controller of claim 87, wherein the input data received by the alarm controller programs the alarm controller with a user name and a password associated with the user name.

10 96. The alarm controller of claim 87, wherein the alarm controller includes a memory device in which application software is stored and the input data includes application software that is downloaded into the memory device.

97. The alarm controller of claim 75, wherein the alarm controller transmits data to at least one computer device of the network after the network
15 address is entered on the at least one computer device and the data transmitted by the alarm controller is routed to the at least one computer device through at least one network hub of the network and through at least one server of the network.

98. The alarm controller of claim 75, wherein the alarm controller is able to receive from at least one computer device of the network data that
20 configures the alarm controller after the network address is entered on the at least one computer device and after a user ID and a password are entered on the at least one computer device.

99. The alarm controller of claim 98, wherein the data that configures the alarm controller is routed to the alarm controller from the at least one
25 computer device through at least one network hub of the network and through at least one server of the network.

100. A medical gas alarm system for use in a healthcare facility having a medical gas system including source equipment and a number of lines that are routed from the source equipment to outlets located throughout the healthcare
30 facility, the medical gas alarm system comprising

a master alarm controller adapted to receive a plurality of alarm signals, each alarm signal being indicative of a respective alarm condition in the

source equipment, the master alarm controller including a display screen that displays text messages identifying any alarm conditions that occur.

101. The medical gas alarm system of claim 100, wherein the master alarm controller includes buttons that are operable to program the text messages that appear on the display screen for each of the alarm conditions.

102. The medical gas alarm system of claim 101, wherein the master alarm controller is configured to host a website that is used to program the master alarm controller with the text messages that appear on the display screen for each of the alarm conditions.

103. The medical gas alarm system of claim 101, wherein the master alarm controller includes a port to which a personal computer couples to provide an additional way to program the master alarm controller with the text messages that appear on the display screen for each of the alarm conditions.

104. The medical gas alarm system of claim 100, wherein the master alarm controller is configured to host a website that is used to program the master alarm controller with the text messages that appear on the display screen for each of the alarm conditions.

105. The medical gas alarm system of claim 100, wherein the master alarm controller includes a plurality of LED's, each LED of the plurality of LED's being assigned to at least one of the alarm conditions, and the plurality of LED's operate to provide a visual indication of any alarm conditions that occur.

106. The medical gas alarm system of claim 105, wherein the master alarm controller includes buttons that are operable to assign each LED of the plurality of LED's to a selected one of the alarm inputs.

107. The medical gas alarm system of claim 105, wherein the master alarm controller is configured to host a website that is used to assign each LED of the plurality of LED's to a selected one of the alarm inputs.

108. The medical gas alarm system of claim 105, wherein the master alarm controller includes a port that is adapted to couple to a personal computer which is operable to assign to each LED of the plurality of LED's a selected one of the alarm inputs.

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116. The alarm controller of claim 112, wherein the electric circuit is adapted to couple to the network and to receive signals from at least one of the computer devices to assign to each alarm signal the message to appear on the display.

117. The alarm controller of claim 116, wherein the electric circuit
5 includes an input port that is adapted to couple to a personal computer to receive
commands from the personal computer to assign to each alarm signal the message to
appear on the display.

118. The alarm controller of claim 112, wherein the electric circuit includes an input port that is adapted to couple to a personal computer to receive commands from the personal computer to assign to each alarm signal the message to appear on the display.

119. The alarm controller of claim 112, wherein the electric circuit operates to alternate the text messages that appear on the display when more than one alarm condition occurs in the medical gas system.

120. An alarm controller for use in a healthcare facility having a medical gas system and a network of computer devices, the alarm controller being configured to receive a plurality of alarm signals that are each indicative of a respective alarm condition occurring in the medical gas system, the alarm controller being coupled to the network, and the alarm controller being programmed to send an e-mail to at least one designated e-mail address to provide notification of any alarm conditions that occur.

121. The alarm controller of claim 120, wherein the e-mail contains information identifying any of the alarm conditions that occur.

122. The alarm controller of claim 120, wherein the e-mail address
25 is associated with a pager service provider and the e-mail is configured such that the
pager service provider initiates a page after receiving the e-mail.

123. An alarm controller for use in a healthcare facility having a medical gas system and having a network of devices including at least one paging device that is configured to page pagers, the alarm controller being configured to receive a plurality of alarm signals that are indicative of respective alarm conditions occurring in the medical gas system, the controller being coupled to the network, and the alarm controller being programmed to send to the network a signal that prompts

the paging device to page at least one designated pager to provide notification of any alarm conditions that occur.

124. An alarm controller for use in a hospital having a medical gas system, the alarm controller comprising an electric circuit configured to receive a plurality of alarm signals from the medical gas system, each alarm signal being indicative of a respective alarm condition occurring in the medical gas system, the electric circuit including at least one memory device, the electric circuit storing data in the memory device to create a history log of the alarm conditions that occur in the medical gas system.

125. The alarm controller of claim 124, wherein the history log includes data indicating a date and a time that each of the alarm conditions occurred.

126. The alarm controller of claim 124, wherein the alarm controller hosts a website and the history log includes data identifying user names and passwords of any users accessing the website.

127. The alarm controller of claim 124, wherein the electric circuit is configured to perform self-diagnostic tests and the event log includes data identifying any self-diagnostic tests that are failed.

128. The alarm controller of claim 124, wherein the alarm controller hosts a website having a web page at which the event log is displayed.

129. The alarm controller of claim 128, wherein the web page includes an icon that, when selected, permits the event log to be saved to a file in a user's computer.

130. A sensor module for use in a medical gas alarm system having a gas line through which pressurized gas flows, the sensor module comprising a housing,

a transducer coupled to the housing, the transducer being exposed to a gas pressure in the gas line, the transducer generating a pressure signal indicative of the gas pressure in the gas line, and

an electric circuit coupled to the housing, the electric circuit receiving and processing the pressure signal, the electric circuit being adapted to output serial data including data indicating the pressure in the gas line, a type of gas in the gas line, and a serial number assigned to the sensor module.

131. The sensor module of claim 130, wherein the serial data includes data indicating a software revision number of software stored in the electric circuit.

132. The sensor module of claim 130, wherein the serial data
5 includes data indicating whether a fault condition has occurred in the electric circuit.

133. The sensor module of claim 132, wherein the serial data includes data indicating an error code that identifies any fault conditions that occur.

134. The sensor module of claim 130, wherein the electric circuit includes a visual indicator that indicates whether the sensor module is operating properly.

135. The sensor module of claim 134, wherein the visual indicator includes a light emitting diode that flashes at a first frequency when the sensor module is operating properly and that flashes at a second frequency different than the first frequency when the sensor module is malfunctioning.

15 136. The sensor module of claim 130, wherein the electric circuit includes power lines which receive power for the electric circuit and the serial data is transmitted on the power lines.

137. A method of installing a medical gas alarm system in a
healthcare facility having a medical gas system and a network of computer devices,
20 the method comprising

providing a first alarm controller,
coupling to the first alarm controller a first input signal line on which
is carried a first input signal indicative of a first condition of a first portion of the
medical gas system,

25 coupling the first alarm controller to the network,
 providing a second alarm controller,
 coupling to the second alarm controller a second input signal line on
which is carried a second input signal indicative of a second condition of a second
portion of the medical gas system, and

30 coupling the second alarm controller to the network.

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138. The method of claim 137, further comprising accessing a first website hosted by the first alarm controller and configuring the first alarm controller for operation via the first website.

139. The method of claim 138, further comprising accessing a
5 second website hosted by the second alarm controller and configuring the second
alarm controller for operation via the second website.

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